





UPSCALING PAINTED RELEASE FILMS FOR THE SUSTAINABLE PRODUCTION OF TOMORROW

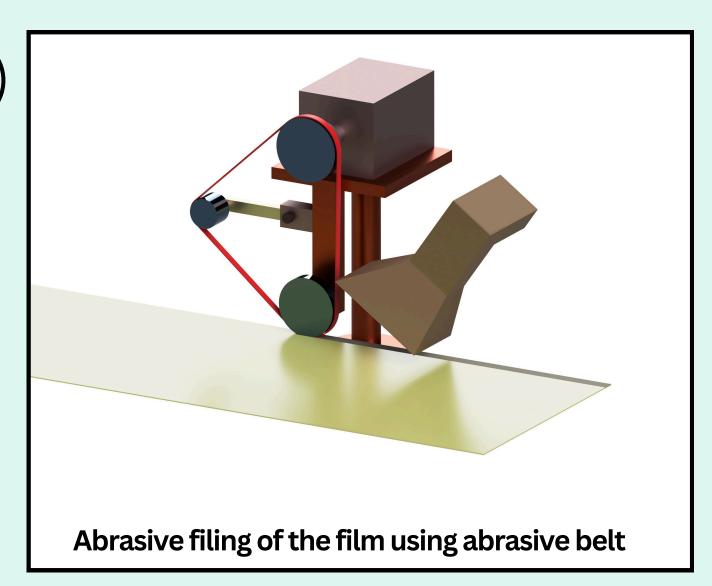
Group Members: Tirtha Prasad Amonkar, Ahmed Faraz, Aravind Arunkumar, Jacquelin Abraham, Sathiyavarshan Kuppusamy, Joseph Sanki **Supervisor: Manuel Löwe**

AIM

- Achieve an airtight combination of multiple release films
- Maintain the film thickness after joining
- Ensure a smooth joint seam for uniform surface quality
- Fill gaps in the paint layer to prevent imperfections
- Measure and control film layer thickness for precision manufacturing

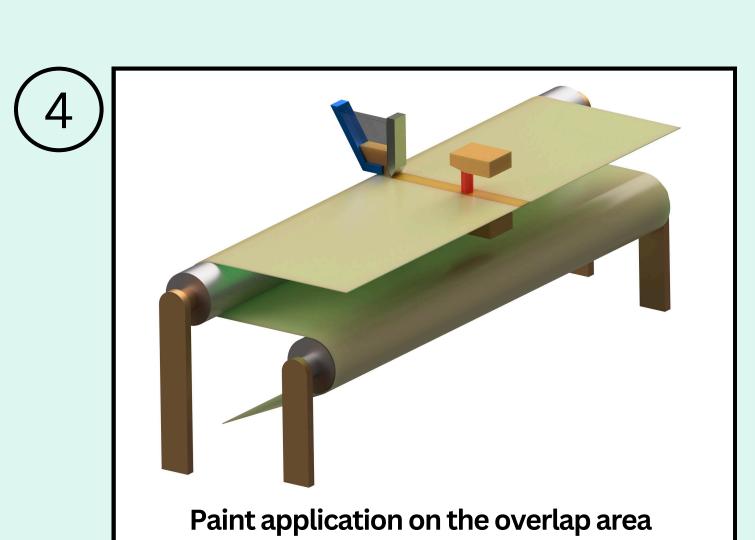
METHODOLOGY

- Solution Identification Selected solvent bonding
- Solvent selection & Testing Chose Formic Acid
- Validation through lab-scale testing
- Process Automation Development
- Automated System Design & Visualization (2D & 3D)



Pre-Treatment Zone

- Prepares the surfaces for optimal adhesion
- Remove the release layer from the films using abrasive belt
- Ensure a uniform surface for the next steps



Painting Zone

 Applies the paint to the overlap surface using a squeegee system

using squeegee blade

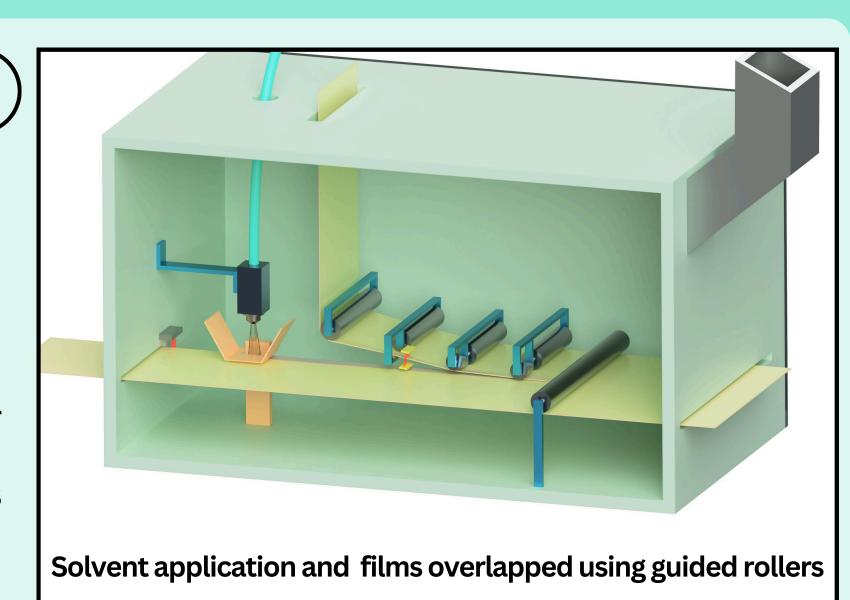
- Performs quality checks on the painted surface
- Dries the applied paint using a heat curing system

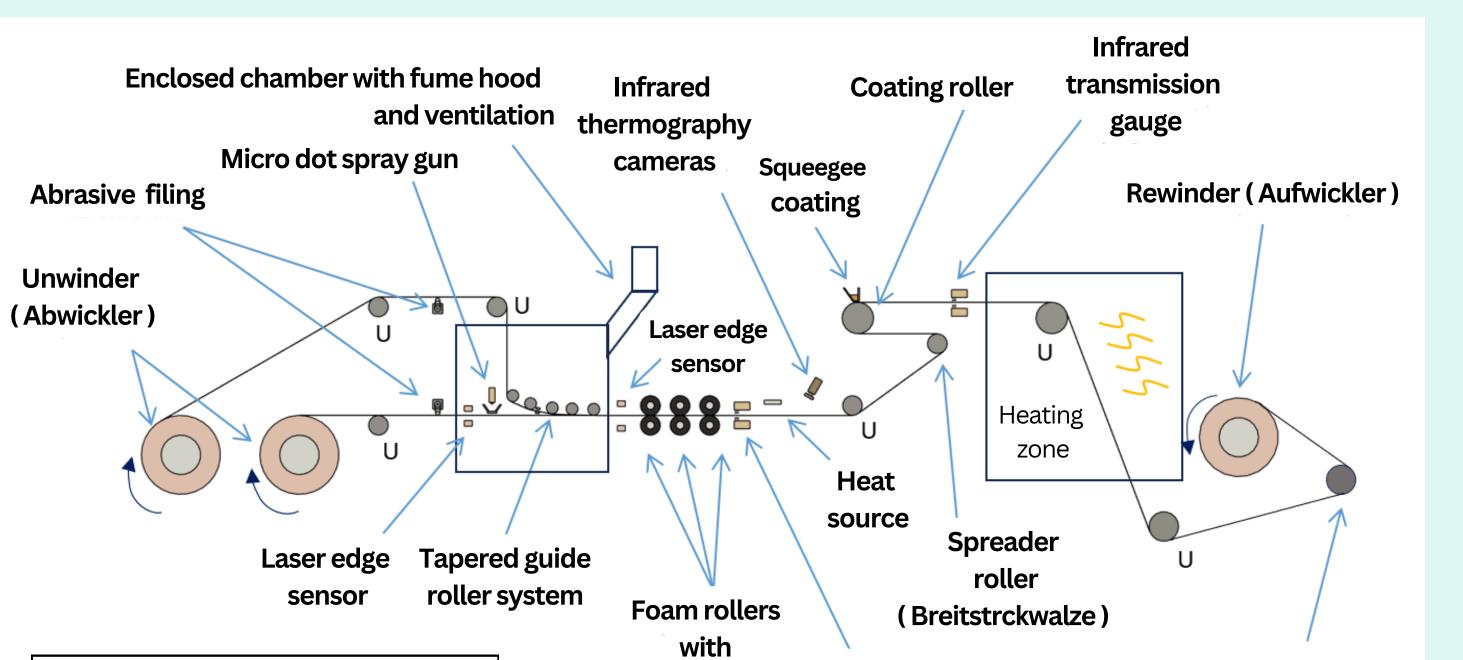
CONCEPT OVERVIEW



Solvent Zone

- Applies Formic Acid solvent using a microdot spray system
- Uses guided rollers with laser sensors for precise overlap adjustment





pressure

sensors

Infrared

transmission gauge

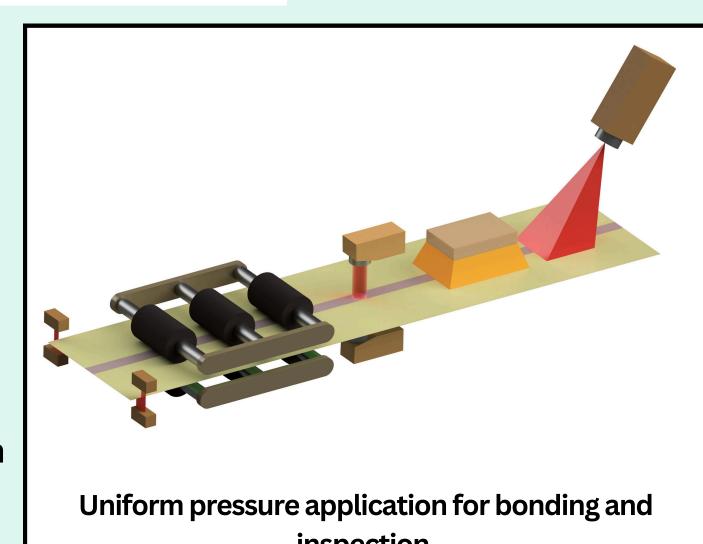




U - Guide rollers (Umlenkwalzen)

Inspection Zone and Final Quality Control

- Uniform bonding with pressure rollers
- Measures film thickness using infrared transmission gauge
- Infrared camera to detect defects



inspection

Design of Experiments

No.	Width (mm)	Overlap (mm)	Drops (0.04 ml)	Application	Tapering	Repetition
1.	30	5	1	Pipette	Dremel*	3
2.	30	5	2	Pipette	Dremel*	3
3.	30	10	2	Pipette	Dremel*	3
4.	30	10	3	Pipette	Dremel*	3
5.	30	10	3	Pipette	None	3

^{*}Dremel-Multi tool-abrasive sanding paper

TESTING

Box Plot of Max Load for Different Film Types Ê

Results

Pure Film

Spreader roller

(Breitstrckwalze)

CONCLUSION

- Successfully developed a scalable solvent bonding process for release films
- Validated through tensile tests, confirming stronger bond strength with Formic Acid.
- Completed process visualization, providing a clear roadmap for automation

Group Members	Task areas	Devoted Time in hours
Tirtha Prasad Amonkar	Product owner, Concept flowchart	98
Ahmed Faraz	Product owner, Testing	97
Aravind Arunkumar	Scrum master	95
Jacquelin Abraham	Literature review, Concept flowchart	95
Sathiyavarshan Kuppusamy	Concept visualization	97
Joseph Sanki	Literature review, Poster design	95

Solvent Welded

Films

Hot Melt Joined

Films